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Video

Distribution

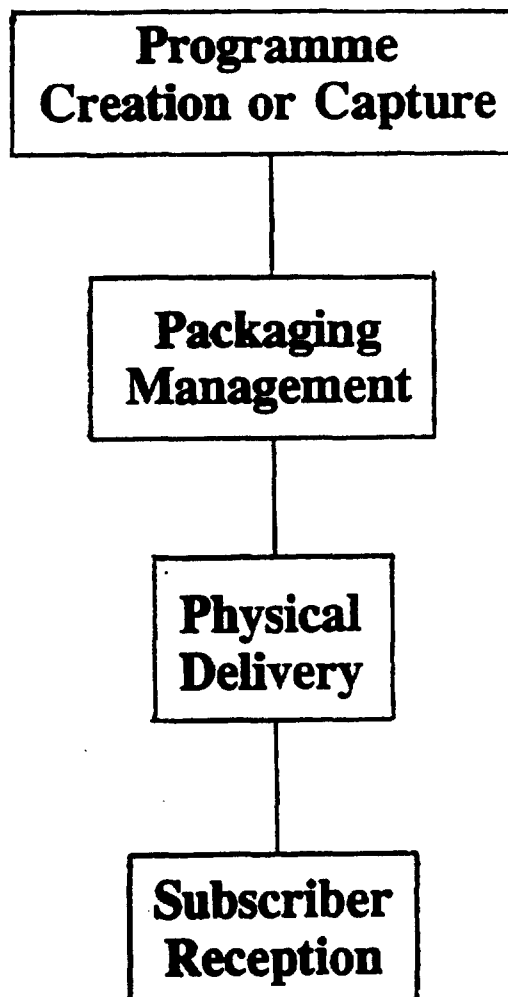
Systems

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Service Delivery Chain

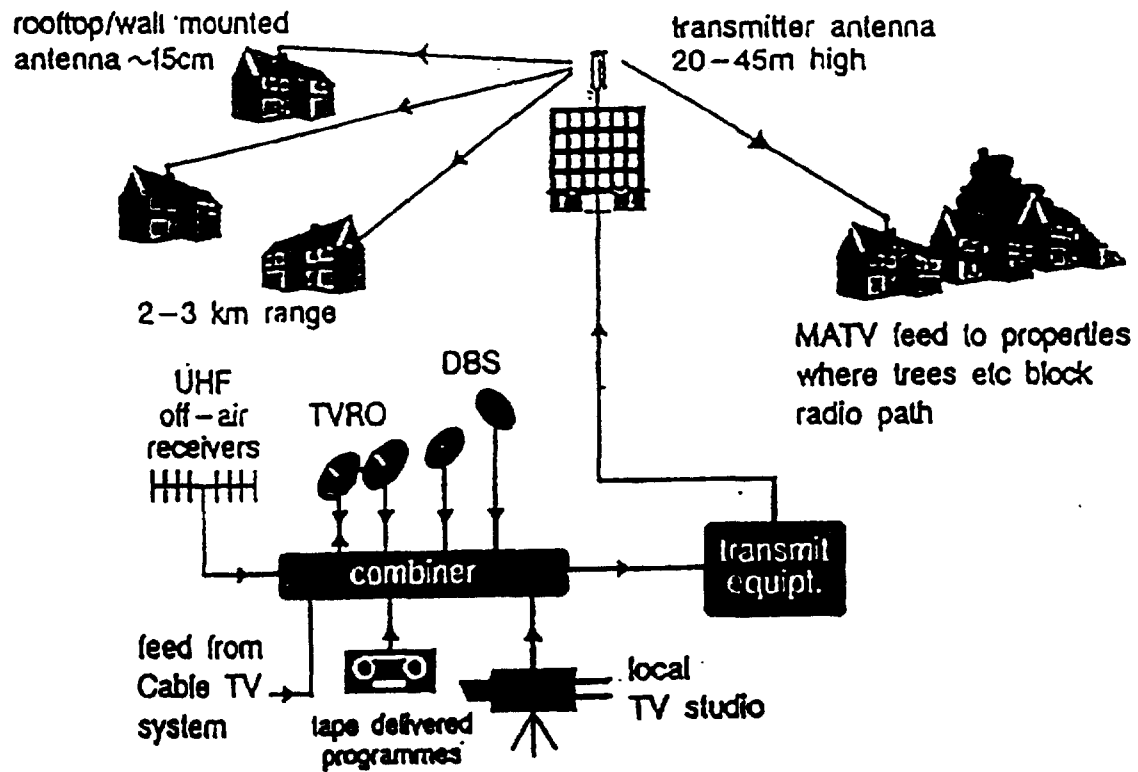


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MVDS TRANSMISSION SYSTEM



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MVDS Position

- * Cable-like features**
 - **Broad band**
 - **Interactive possibility**
- * DTH-like features**
 - **Speed**
 - **Low marginal cost**

Where?

- * Remote population pocket; Infill**
- * Sparsely populated areas**
- * Areas requiring rapid installation or upgrade**

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Why Today's Interest?

- * Market Fragmentation**
- * Deregulation / Competition**
- * Converging Markets**
 - entertainment**
 - telecommunications**
 - financial services**
- * Maturing Technology**

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Regulatory Position

- * World - ITU/WARC Broadcasting
bands 12, 29, 42 GHz**
- * USA - MVDS Pioneer's Licence
29 GHz**
- * Europe - CEPT MVDS band
42 GHz**
- * UK - 1990 Broadcasting Act
LDO Licence Wireless
Telegraphy Licence
MPT 1550**

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IBC 94

**The UK technical and regulatory
framework established for multipoint video
distribution systems at 40 GHz**

**A V Harris
Radiocommunications Agency, UK
20 September 1994**



System Design Aspects

- **Frequency modulation, 26 MHz channel bandwidth**
- **Commonality with Fixed Satellite Service / Direct To Home parameters**
- **29.5 MHz co-polar channel spacing**
- **14.75 MHz cross-polar channel interleaving**
- **4 channel groups of 32 channels, horizontal and vertical polarisations**
- **PAL/I and other transmission standards, digital transmission not precluded**



Quality Criteria

- Carrier to noise ratio (C/N) of 12 dB
- CCIR Grade 4 "satisfactory" picture grade
- Service availability: all but 1% Worst Month (0.3% t)
(same availability as specified for the Broadcasting Satellite Service)



Performance specification and licensing regime

- Performance specification issued by the RA as MPT1550 to be used for type approval purposes, controlling spectrum utilisation parameters
- MVDS services licensed and franchises awarded under the Local Delivery Services (LDS) provisions of the UK Broadcasting Act 1990
- Technical plans for MVDS will be assessed by the ITC and RA for coverage and interference potential
- Terrain shielding and antenna directivity to be used to minimise interference to other existing or potential MVDS operators
- 64 ° sector coverage antenna should ensure minimum coverage area of 13 km²



Propagation Aspects At 40 GHz

- Atmospheric absorption due to oxygen and water vapour is 0.15 dB/km
- 1% WM (0.3% time) availability gives 7 mm/hour rainfall rate equivalent to 2.2 dB/km for UK, CCIR rain zone G
- Rain induced cross-polar discrimination is 25 dB over 5 km path at 25 mm/h
- Frequency re-use distance under investigation; propagation experiments under way in UK at Rutherford Appleton Laboratory and Essex University



MVDS Architecture

- * **Per Franchise**
 - Programme capture
 - Subscriber management
 - Encryption

- * **Per Cell**
 - Signal transport
 - Signal broadcast
 - Return path & switch

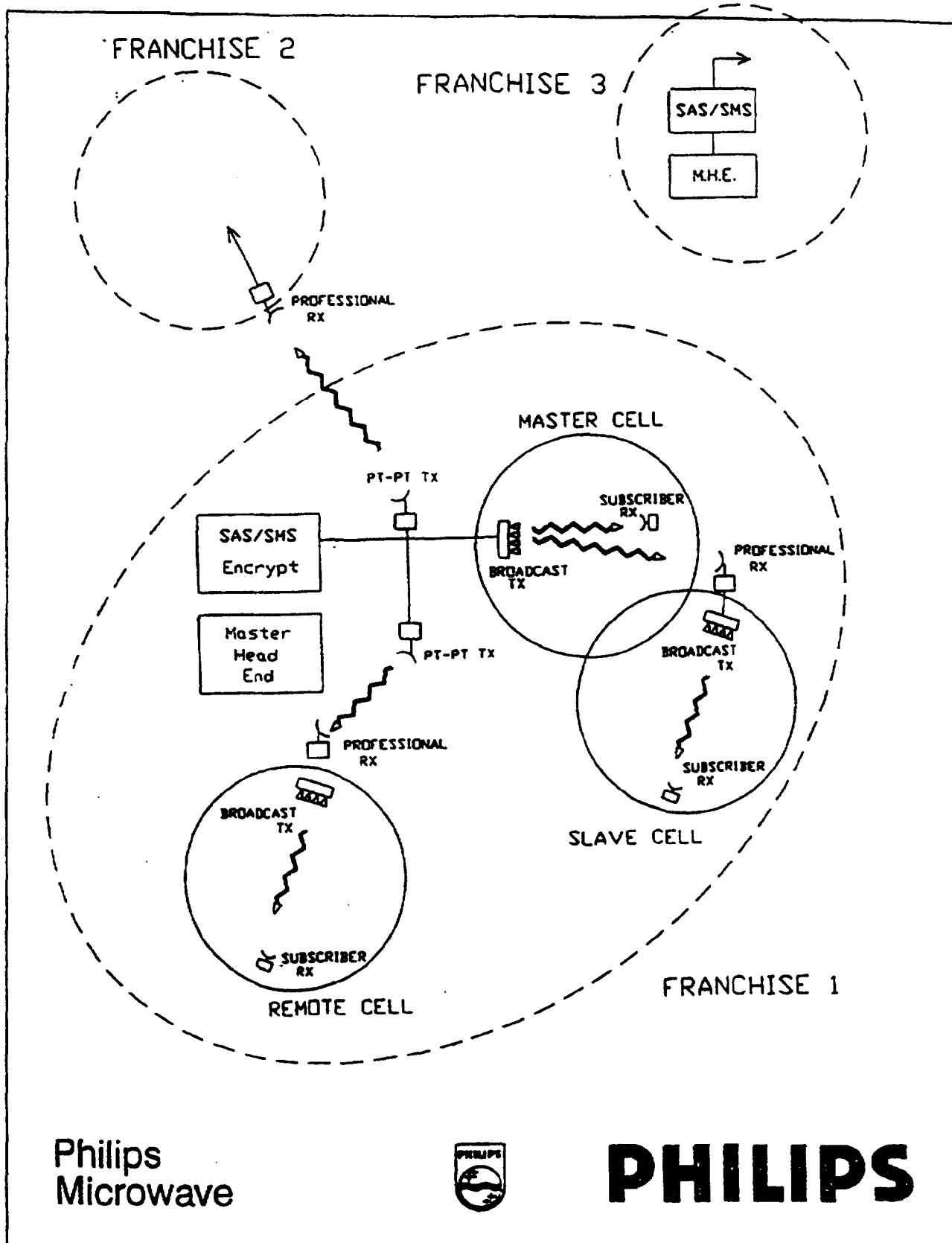
- * **Per Household**
 - RX downconverter
 - TX upconverter

- * **Per Consumer**
 - TX/RX indoor unit
 - Smartcard authorisation

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Transmitter Cost Estimate

- * Based on RA Report
- * 25 + 5 channels £27,500 ... 47,500
- * 32 + 4 channels £33,000 ... 57,000
- * Excludes
 - programme generation/capture
 - subscriber management
 - encryption
 - planning/installation

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Receiver Cost Comparison

	DBS	MVDS
Cable	-	-
Antenna	50 cm dish	20 cm dish
Conversion #1	-	FET DRO Varactor Mixer pair
Conversion #2	LNA MMIC FET DRO	LNA MMIC FET DRO
950...2050 MHz	MMIC	MMIC
Outdoor Unit	£30 ... 60	£65 ... 130
Indoor Unit	£115	£115
Installation	£40	£40

* Cost determine by volume

* Cost of 42 GHz devices not prime

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Cost Comparison with Cable (1)

- * Based on RA report
- * Underground cable
- * 50000 households

Penetration

	25%	33%	50%
Per subscriber	£1300	£1000	£700
Assign TV	£ 780	£ 600	£ 420
Assign telephony	£ 520	£ 400	£ 280

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Breakeven Community (cf. cable)

Penetration

	25%	33%	50%
Total cost	£780	£600	£420
Typical RX	(£265)	(£265)	(£265)
Shared TX	£515	£335	£155
Typical TX	(£ 55k)	(£ 55k)	(£ 55k)
Community	427	425	710

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Revenue

(Courtesy of FSN Ltd, Cambridge)

*** Franchise 100 000 households**

- * Television - 80% coverage**
- 20% penetration**
- 16000 customers**
- £18 revenue/customer p.m.**
- £3,46M revenue p.a.**
- (£1,12M) programming costs**

Net revenue p.a. - £2,34M

- * Telephony - 25% residential penetration**
- 20000 customers**
- £13 revenue/customer p.m.**
- 15% business penetration**
- 800 business lines**
- £200 revenue/customer p.m.**

Net revenue p.a. - £5,04M

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Digital Requirement

* MPEG-2 with DVB shell

CDI quality	1,6 MBit/s
Typical content	3-5 MBit/s
Rapid movement	> 8 MBit/s

* Cable service - 64 QAM

* Satellite service - QPSK

prETS 300xxx/6 May 1994	
FEC for 10 EXP-11 at 8dB C/N	
Redundancy	15 ... 100%
Useful bit rate	19...34 MBit/s

* Thus, MVDS

Programmes/transponder	4 ... 12
System gain improvement	~4 dB

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Digital Migration

- * **Channel \Rightarrow Transponder**
- * **QPSK or OQPSK**
- * **Standard Master Head End**
- * **Review TX**
- * **Transparent RXO**
- * **Standard RXI**

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The Way Forward

- * Technology**
 - **Propagation**
 - **Protection ratio**
 - **Digital modulation**
- * Regulatory**
 - **Digital**
 - **Duplex**
 - **Extend to ETS**
- * Commercial**
 - **Eurobell West Kent**
 - **Next LDO round**

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Duplex (interactive) MVDS

- * Copper twisted pair**

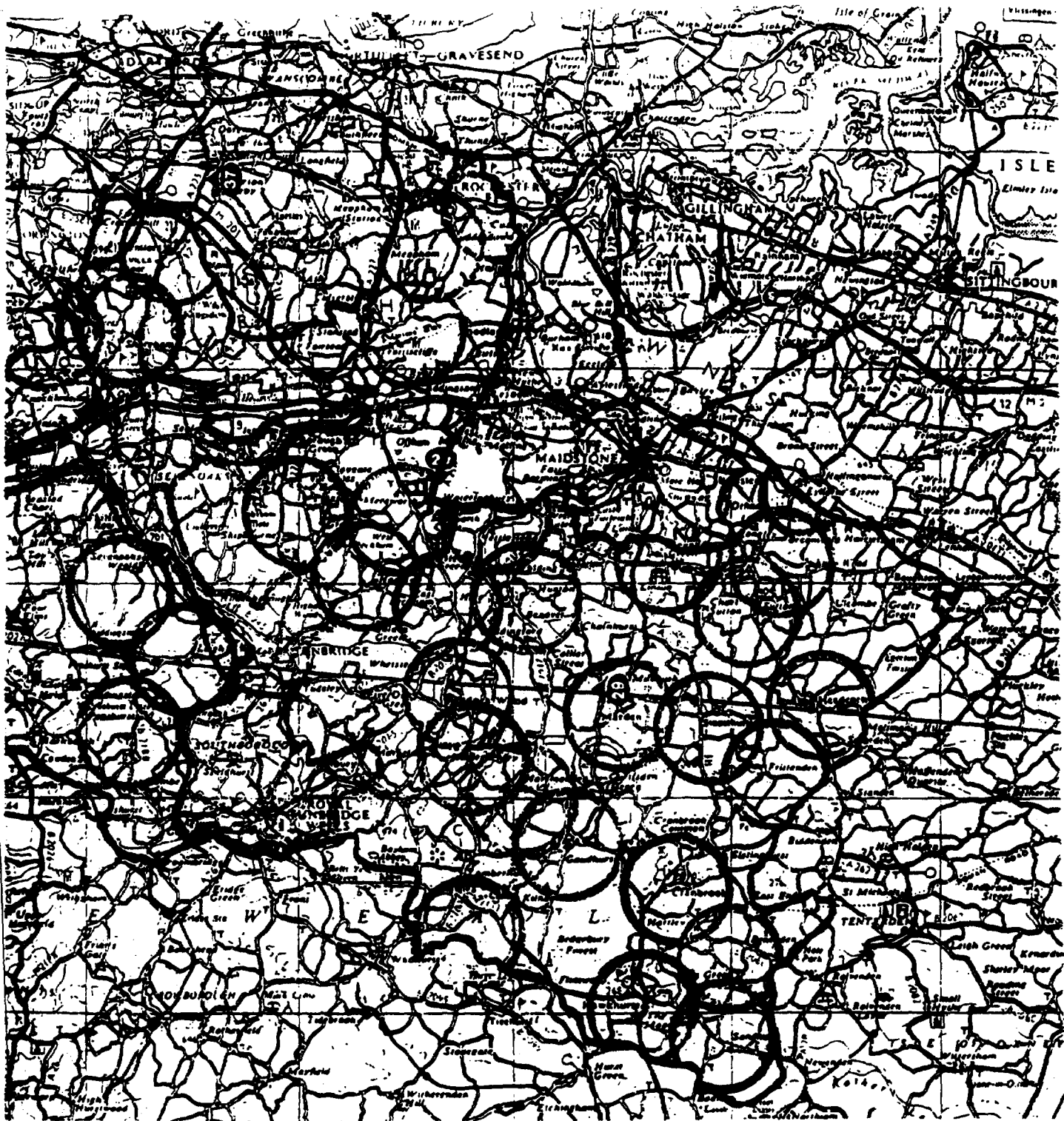
- * Mobile telephony - GSM**
- DECT

- * In-band radio - modulation**
- frequency plan

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EUROBELL